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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/693,244	10/24/2003	Takatoshi Tsujimura	CMO.0012US (92096US)	1416
21906	7590	06/26/2006	EXAMINER	
TROP PRUNER & HU, PC 1616 S. VOSS ROAD, SUITE 750 HOUSTON, TX 77057-2631			TUROCY, DAVID P	
			ART UNIT	PAPER NUMBER

1762

DATE MAILED: 06/26/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/693,244

Applicant(s)

TSUJIMURA ET AL.

Examiner

David Turocy

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 April 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-14,17,18 and 26-31 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3-14,17,18,29 and 30 is/are rejected.
- 7) ☒ Claim(s) 26-28 and 31 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.

- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 4/6/06 has been entered.

Response to Amendment

2. Applicant's amendments, filed 4/6/2006, have been fully considered and reviewed by the examiner. The examiner notes the amendments to claims, therefore the 35 USC 1st rejection (scope of enablement) and 35 USC 112 2nd have been withdrawn. Additionally, the rejections over Wang and Anh have been withdrawn in view of the amendments. The examiner notes the cancellation of claims 2, 15-16, 19-21, and 22-23. Claims 1, 3-14, 17, 18, and 26-31 are currently pending.

Response to Arguments

3. Applicant's arguments filed 4/6/06 have been fully considered but they are not persuasive.

The applicant has argued against the 35 USC 112 1st Lack of written description rejection, stating claim 30 clearly has support in the specification at paragraph 033, 036, and 039 as well as Figure 3(b). While the paragraphs disclose a majority of the SiH₂

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molecules absorb as well as a majority of the SiH_4 supplied is absorbed during the deposition process, such limitations are not commensurate in scope with the claim, wherein the claim require the deposited microcrystalline film to be the majority of the film on the substrate, not the majority of the supplied gases depositing. The specification does not describe the scope of the deposition process depositing "a majority" of the microcrystalline thin film on the substrate.

The applicants have argued against the Nakata '349, stating the reference clearly discloses depositing amorphous silicon during the first process and does not disclose the microcrystalline thin film in the second process. In addition the applicant has argued against the combination of Nakata '349 with Nakata '062 stating that there is no motivation to modify '349 with '062. While the examiner agrees Nakata '349 discloses depositing an amorphous silicon during the first process, however, the examiner notes the claim as written does not require there to be no amorphous deposition during the first process. Additionally the examiner notes the process as taught by Nakata '349 does not teach of depositing a microcrystalline thin film in the second step, it is the examiners position that after stopping the flow of SiH_4 , the process of Nakata '349 inherently results in at least a quantitative amount of continual deposition, during the second step, at which H_2 is maintained at a constant rate, due to the presence of SiH_4 and H_2 remaining in the process chamber. In addition, residual SiH_4 remaining in the process chamber with the constant flow of H_2 will result in a H_2 to SiH_4 dilution ratio to deposit a quantitative amount of microcrystalline thin film directly from the vapor phase, See Nakata '062 which discloses adjusting the hydrogen dilution ratio to deposit

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microcrystalline thin films directly from vapor phase (Column 5, lines 20-25). Therefore the examiner has not modified Nakata '349 with Nakata '062, but rather has supplied Nakata '062 as a showing that the certain H_2 to SiH_4 dilution ratio results in a microcrystalline thin film. In addition, the examiner has noted stopping the flow of SiH_4 with continual H_2 flow, will in time result in a dilution ratio, due to the residual SiH_4 remaining in the chamber, as described by Nakata '062 and result in a quantitative amount of microcrystalline thin film directly from the vapor phase.

The applicant has argued against the Nakata reference, stating the reference teaches a method of depositing microcrystalline thin film by supplying continuous SiH_4 and H_2 and one of ordinary skill in the art would not have been taught the claimed method. While the examiner notes Nakata does in deed teach two alternative methods for forming the microcrystalline thin film, the examiner notes the rejection is not based on modifications of example 1 of Nakata, only supplying evidence that certain H_2 to SiH_4 dilution ratio results in a microcrystalline thin film.. Additionally, the examiner maintains the residual SiH_4 in the chamber, after stopping the supply, and the continual supply of H_2 will result in a dilution ratio to deposit a microcrystalline thin film.

The applicant has argued, while there is not teaching of residual SiH_4 , if SiH_4 does exist then the deposition must be amorphous because it is being deposited on amorphous silicon. It is well settled that arguments of counsel unsupported by competent factual evidence of record are entitled to little weight. *In re Payne*, 606 F.2d 303,315, 203 USPQ 245,256 (CCPA 1979).

The applicant has argued against the examiners combination of Nakata '349 with the admitted state of the art on page 3 of the specification, stating there is no motivation to combine the reference with the background as supplied by the applicant. The examiner notes however, that the examiner has not modified Nakata '349 with the admitted state of the art, but rather has supplied the admitted state of the art as a showing that applying a high-energy electric field to the SiH_4 results in breaking the SiH_4 down into a more reactive SiH_2 .

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claim 30 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The added limitation "depositing the microcrystalline thin film forms a majority of the microcrystalline thin film on the substrate" appears to be new matter. The examiner cannot ascertain support in the specification for such an added limitation. If the

applicant can provide support from the written description on the record then the new matter rejection will be withdrawn.

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claim 31 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

8. Claim 31 recites the limitation "the first process" in line 1. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was

not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

10. Claims 1, 3-14, 17-18 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 5686349 by Nakata, hereafter Nakata '349 in view of US Patent 6271062 by Nakata, hereafter Nakata '062.

Nakata '349 teaches a method of forming a microcrystalline thin film comprising a first process of supplying SiH_4 and H_2 comprising gases into a chamber with a substrate, a second process of supplying H_2 alone to the chamber and repeating the first and second process a plurality of times without removing the substrate from the chamber (Abstract, Example 1). Nakata '349 discloses supplying H_2 at a constant rate during both the first and second process and SiH_4 has a first rate during the first process and is not supplied during the second process (Example 1). Nakata '349 discloses repeating the first process and second process to deposit a microcrystalline thin film of desired thickness (Column 5, lines 60-64).

While the examiner notes the process as taught by Nakata '349 does not teach of depositing a microcrystalline thin film in the second step, it is the examiners position that after stopping the flow of SiH_4 , the process of Nakata '349 inherently results in at least a quantitative amount of continual deposition, during the second step, at which H_2 is maintained at a constant rate, due to the presence of SiH_4 and H_2 remaining in the

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process chamber. In addition, residual SiH_4 remaining in the process chamber with the constant flow of H_2 will result in a H_2 to SiH_4 dilution ratio to deposit a quantitative amount ("a portion") of microcrystalline thin film directly from the vapor phase, See Nakata '062 which discloses adjusting the hydrogen dilution ratio to deposit microcrystalline thin films directly from vapor phase (Column 5, lines 20-25). The examiner notes the claim as written only requires that a portion of the microcrystalline thin film is deposited during the second step and does not require no thin film deposition during the first step.

Nakata '349 fails to explicitly teach of converting the SiH_4 to SiH_2 , which contains a polymer-forming element, by the application of the electric field. However, as evidenced by the admitted state of the art discloses when applying a high-energy electric field to the SiH_4 is broken down into a more reactive SiH_2 , which may form a polymer by bonding to each other (Specification Page 3). In addition a flow ratio and an electric field density, which satisfy the relationship as, taught by claim 13, must necessarily result in the formation of the polymer forming SiH_2 .

Nakata '349 teaches of supplying the gases with a flow rate ratio, r , equal to 100 and an electric field intensity, P , of 1000 mW/Cm^2 , which satisfies the relationship as claimed (Example 1).

Therefore, the prior art and the present claims, reflected by claim 4 and 13, teach all the same process steps and thus the results obtained by applicants process must

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necessarily be the same as those obtained by the prior art. Therefore by applying an electric field in the chamber with SiH_4 and H_2 , with a flow rate ratio and electric intensity satisfying the claimed relationship, it must necessarily result in breaking the SiH_4 to a third gas SiH_2 , or activating the source gas to contain an element which forms a polymer due to bonding. Either 1) the applicant and the prior art have different definitions of applying an high-intensity electric field, or 2) the applicant is using other process steps or parameters that are not shown in the claims.

While the examiner notes the process as taught by Nakata '349 does not teach of depositing a third gas, SiH_2 , to a surface of the substrate in the second step, it is the examiners position that after stopping the flow of SiH_4 , the process of Nakata '349 inherently results in at least a quantitative amount of continual deposition of SiH_2 , during the second step, at which H_2 is maintained at a constant rate, due to the presence of SiH_4 and H_2 remaining in the process chamber.

Claim 8 and 10: The prior art and the present claims, reflected by claim 8, teach all the same process steps and thus the results obtained by applicants process must necessarily be the same as those obtained by the prior art. Therefore by supplying the second gas during a portion of the deposition of the third gas, it must necessarily result in reduction of formation of the polymer of the third gas prior to deposition. Either 1) the applicant and the prior art have different definitions of depositing the third gas during the

second process without the first process gas, or 2) the applicant is using other process steps or parameters that are not shown in the claims.

Claim 17: Nakata '349 teaches of a method of manufacturing a thin film transistor by forming a gate electrode, forming an insulation layer on the gat electrode and forming a channel layer film on the insulation layer by using the microcrystalline thin film forming method of claim 9 and then subsequently forming a source electrode on the channel layer (Column 3, lines 14-45).

Claim 14: Nakata '349 teaches all the limitations of this claim as applied to claim 9 above, however, they fail to disclose a supplying process of 2 seconds or less and the source deposition process longer then the source supplying process.

However, It is the examiners position that the process parameter of time is a known result effective variable. If time were low it would result in insufficient film thickness and too much time would result a larger film thickness then desired

Therefore it would have been obvious to one skill in the art at the time of the invention was made to determine the optimal value for the time for the source supplying process and the deposition process used in the process of Nakata '349 in view of the admitted state of the art as taught by the applicants description, through routine experimentation, to impart the substrate with the desired film thickness.

Claim 18: Nakata '349 teaches all the limitations of this claim as applied to claim 9 above, however, they fail to explicitly disclose the claimed distance for the microcrystalline film from the insulation layer. However, Nakata '349 discloses a portion of the channel layer comprises a microcrystalline thin film less then 500 angstroms from

the insulation layer (Column 3, lines 14-45). In the case where the claimed ranges "overlap or lie" inside ranges disclosed by prior art a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257 191 USPQ 90. See MPEP 2144.05.

Allowable Subject Matter

11. Claims 26, 27, 28, and 31 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

None of the prior art cited or reviewed by the examiner alone or in combination reasonably suggests supplying in a first process H_2 and SiH_4 in a ratio to prevent amorphous deposition and then stopping the SiH_4 to deposit microcrystalline silicon.


Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David Turocy whose telephone number is (571) 272-2940. The examiner can normally be reached on Monday-Friday 8:30-6:00, No 2nd Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private-PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

David Turocy
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TIMOTHY MEEKS
SUPERVISORY PATENT EXAMINER